

## **REMARKS**

Claims 1, 4-12, and 17-26 are pending in the application. Claims 1, 18-20, and 26 have been amended. Further, claims 4-12 have been withdrawn pursuant to a restriction requirement. No new matter has been added by the amendment.

### **Rejection Under 35 U.S.C. § 112, second paragraph**

Claims 18 and 19 have been rejected for failure to provide proper antecedent basis for the recited acetic acid component. The rejection is overcome in view of the amendment of claim 18 in which the recited acetic acid component, and its concentration relative to the recited potassium hydrogen peroxomonosulfate, have been removed from the "wherein clause."

In addition to the amendment of claims 18 and 19, claim 26 has been amended to correct an inadvertent error by removing the words "layer is" from the claim.

### **Rejection Under 35 U.S.C. § 103(a)**

Claims 1 and 17-26 have been rejected over Mueller et al. in view of Ernst. This rejection is overcome in view of the following remarks.

Claims 1, 18, and 20 recite an anisotropic copper etching agent in which acetic acid is present in a range of about 10 wt.% to about 75 wt.% relative to potassium hydrogen peroxomonosulfate. These claims have been amended to include the term "about" in relation to the claimed numerical range. The applicants respectfully assert that neither Mueller et al. nor Ernst suggest or disclose the claimed concentration relationship.

The applicants have addressed Mueller et al. at length in previous responses and the applicants prior remarks with respect to Mueller et al. are incorporated by reference herein. As previously argued by the applicants, Mueller et al. does not suggest or disclose the applicants claimed invention at least because Mueller et al. disclose a slurry composition for use in a chemical-mechanical-polishing process. In contrast, the applicants claim an anisotropic copper etching agent.

Ernst discloses stabilized acidic hydrogen peroxide solutions that can function with acetic acid. Ernst, however, does not suggest or disclose acetic acid in combination with potassium hydrogen peroxomonosulfate. The applicants assert that even if one skilled in the art were somehow motivated to combine Ernst with Mueller et al. the applicants' invention would not be realized. This is at least because Ernst discloses an acid concentration range of 30 to 85% relative to the hydrogen peroxide solution. Ernst does not suggest or disclose an acidic acid concentration relative to potassium hydrogen peroxomonosulfate. Neither Mueller et al. nor Ernst suggest or disclose an etching agent having the claimed concentration relationship.

As described in the applicants' response of June 8, 2005, the applicants' claims are directed to an anisotropic copper etching agent. The etching characteristics of the anisotropic etch enables the etch to faithfully reproduce a mask pattern overlying a film with minimal loss of line width. The applicants achieve the anisotropic etching action through their particular claimed concentration relationship of acetic acid in combination with potassium hydrogen peroxomonosulfate. The applicants assert that there is no guidance provided by Mueller et al. or Ernst for combining acetic acid with potassium hydrogen peroxomonosulfate in a specific ratio to achieve the claimed etching action. There is simply no appreciation of the problem in Mueller et al. or Ernst that is solved by the applicants' claimed etching agent. Since the problem of anisotropic etching is not addressed in either reference, the applicants assert that one skilled in the art would not be motivated to combine the teachings of these references to formulate an anisotropic etching agent. Accordingly, the applicants' claims are not obvious in view of Mueller et al. and Ernst. *Smiths Indus. Med. Sys., Inc. v. Vial Signs Inc.*, 51 USPQ 2d 1415, 1420-21 (Fed. Cir. 1999)(the relevant inquiry is whether there is a reason suggestion or motivation in the prior art that would lead one of ordinary skill in the art to combine the references).

Claim 17 depends from claim 1 and recites that the etching agent selectively etches copper. In their specification, the applicants describe the selective etching action of their etching agent. For example, Table 1 on page 42 of the applicants' specification shows the selective etching action of their claimed etching agent. As

shown in Table 1 and described in Example 4, the copper layer was etched at a substantially higher rate than the underlying metal films. Accordingly, the applicants respectfully assert that claim 17 further distinguishes their claimed etching agent over the slurry disclosed by Mueller et al. and the hydrogen peroxide solutions disclosed by Ernst.

Claim 18 recites an anisotropic copper etching agent. In addition to reciting acetic acid is present in a range of 10 wt.% to 75 wt.% relative to potassium hydrogen peroxomonosulfate, claim 18 recites that etching agent etches "the copper layer at an approximately uniform rate throughout the etching process, such that edges of the copper layer are substantially continuous with corresponding edges of the mask pattern." The applicants respectfully assert that this is a functional limitation is not suggested or disclosed by the cited combination of references. The applicants assert that the recited composition and functional limitations.

Claim 19 has been amended to recite that the etching agent of claim 18 selectively etches copper. This claim is allowable at least because neither reference suggests or discloses that the claimed etching agent possesses the functional characteristic recited in claim 19.

Claim 20 recites an aqueous anisotropic copper etching solution. The solution is formulated to anisotropically etch a copper layer having a masking pattern thereon. The applicants respectfully assert that the polishing slurry disclosed by Mueller et al. does not suggest or disclose the applicants claimed aqueous anisotropic copper etching solution. The applicants respectfully assert that their claimed composition is an anisotropic etching agent. As previously argued by the applicants in their Response dated September 14, 2004, the anisotropic etching agent produces a copper etch profile having substantially vertically sidewalls. The applicants respectfully assert that such a result is not possible with the slurry composition disclosed by Mueller et al. nor the hydrogen peroxide solutions disclosed by Ernst. Accordingly, the applicants respectfully assert that their claimed anisotropic etching composition substantially differs from the slurry disclosed by Mueller et al. and the hydrogen peroxide solutions disclosed by Ernst.

Claims 21-26 depend from claim 20 and add further limitations to claim 20.  
These claims are allowable in view of the remarks pertaining to claim 20.

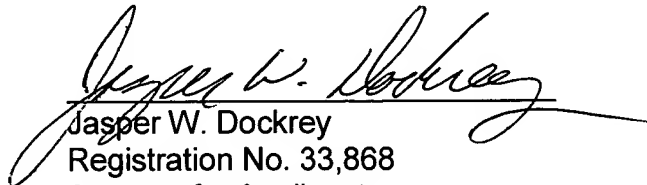
Claims 1 and 17-26 have been rejected over Condra et al. in view of Kubotera et al. and Ernst. This rejection is overcome in view of the following remarks.

The applicants respectfully assert that neither Condra et al. nor Kubotera et al. suggest or disclose the claimed anisotropic copper etching agent having the claimed concentration relationship. The applicants have discussed the teaching of Condra et al. in view of Kubotera et al. in previous responses and those remarks are incorporated herein. The disclosure of Ernst does not overcome the previously described deficiencies of Condra et al. in view of Kubotera et al. Even if one skilled in the art were somehow motivated to combine the teaching of these references, the applicants' claims would not be realized. This is at least because none of these references suggests or discloses an anisotropic etching agent in which acetic acid is present in amounts relative to potassium hydrogen peroxomonosulfate.

The additionally cited references have been carefully examined and found not to be relevant to the applicants' claims.

The applicants have made novel and non-obvious contributions to the art of anisotropic copper etching formulations. The claims at issue distinguish over the cited references and to be in condition for allowance. Accordingly, such allowance is now earnestly requested.

Respectfully submitted,

  
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